

2016 Monitoring Summary



Little Butler Creek at Lauderdale County Road 61 (34.98226/-87.61645)

BACKGROUND

Little Butler is among the least-disturbed watersheds within the Interior Plateau ecoregion, based on landuse, road density, and population density. Since 2016, it has been monitored by the Alabama Department of Environmental Management (ADEM) as a reference watershed for comparison with other streams within the ecoregion. Data from reference watersheds are used to characterize background conditions in different ecoregions throughout the state. Little Butler Creek was sampled in 2016 to provide reference reach data for comparison with streams throughout the Interior Plateau ecoregion.

In addition, Little Butler Creek is located within the Shoal Creek watershed, which has been identified as one of 50 Strategic Habitat Units (SHU) by the U.S. Fish and Wildlife Service (USFWS) and the Alabama Rivers & Streams Network (ARSN). SHUs are recognized as high-quality habitats occupied by federally listed and state imperiled species.



Figure 1. Little Butler Creek at LBTL-1 on May 3, 2016.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. A tributary of Shoal Creek, Little Butler Creek is classified as a *Fish and Wildlife (F&W)* stream located in Lauderdale County. Little Butler Creek is known for its ecological significance, and is one of the most biologically diverse streams per watershed area in Alabama. As a tributary to a SHU, the watershed maintains a geomorphically stable channel and a natural flow regime that support the behavior, growth, and survival of three federally listed endangered and threatened aquatic species, and nine aquatic species listed to be of the *Highest or High Conservation Concern* by the state of Alabama.

The watershed is 66% with no permitted outfalls. It is sparsely populated. There are minimal road disturbances found within the watershed. With <16% of the watershed composed of agricultural land uses, ADEM's measure of watershed disturbance ranks the Little Butler Creek watershed as among the best located within the Interior Plateau ecoregion.

REACH CHARACTERISTICS

General observations (Figure 1, Table 2) and habitat surveys (Table 3) were completed during the Index of Biotic Integrity (IBI) fish assessment. In comparison with reference reaches in the same ecoregion, they give an indication of the physical condition of the site and the quality and availability of habitat. Like other streams in ecoregion 71F, Little Butler Creek at LBTL-1 is a medium-high gradient stream characterized predominantly by cobble and gravel substrates. Overall habitat quality and availability was rated as *Optimal/sub-optimal* for supporting the fish community and the overall ecology of the stream.

Table 1. Summary of general watershed characteristics: LBTL-1 (2016)

Watershed Characteristics	
Basin	Tennessee
Drainage Area (mi²)	8.0
Ecoregion^o	71F
Assessment Unit	AL06030005-0507-200
AU Category	1
12-digit Hydrologic Unit Code (HUC)	060300050507
Conservation Status	
Strategic Habitat Unit †	4 Shoal Ck (0603)
Landuse Categories (2011 National Land Cover Dataset)	
Wetland, Total (%)	1.4
Wetlands, Woody (%)	1.4
Forested, Total (%)	66.4
Forested, Deciduous (%)	60.4
Forested, Evergreen (%)	2.1
Forested, Mixed (%)	4.0
Shrub/Scrub (%)	7.9
Grassland/Herbaceous (%)	4.9
Pasture/Hay (%)	13.5
Crops, Cultivated (%)	2.4
Developed, Total (%)	3.5
Developed, Open Space (%)	3.1
Developed, Low Intensity (%)	0.3
Developed, Medium Intensity (%)	0.1
Population/km² (2010 US Census)	13
Roads	
Road Density	1.3
# Road Crossings per Stream km	0.3
Watershed Disturbance Score*	107
Watershed Disturbance Category*	4

^o Western Highland Rim

† 12-digit HUC located in a Strategic Habitat Unit.

* Measure of watershed disturbance based on landuse, population, and road density summarized in this table.

Table 2. Physical characteristics of Little Butler Creek at LBTL-1, March 29, 2016.

Physical Characteristics	
Width (ft)	30
Canopy Cover	Shaded
Depth (ft)	
Riffle	0.4
Run	1.0
Pool	3.0
% of Reach	
Riffle	35
Run	35
Pool	30
% Substrate	
Bedrock	10
Boulder	5
Cobble	40
Gravel	30
Sand	10
Silt	5

Table 3. Results of the habitat assessment survey conducted on Little Butler Creek at LBTL-1, May 3, 2016.

Habitat Assessment Score	% Max Score	Rating
Instream Habitat Quality	88	Optimal (80-100)
Sediment Deposition	68	Sub-optimal (55-75)
Riffle Frequency	88	Optimal (80-100)
Bank Vegetative Stability	71	Sub-optimal (58-72)
Riparian Zone Measurements	79	Sub-optimal/Optimal (76-84)
Habitat Assessment Score	158	
% Maximum Score	79	Optimal/Sub-optimal (76-79)

BIOASSESSMENT RESULTS

The fish community in Little Butler Creek at LBTL-1 was sampled using Alabama's Fish Community Index of Biotic Integrity (AL-IBI), developed through a multi-agency (GSA, ADCNR, ADEM) project to establish a comprehensive fish community bioassessment tool for Wadeable Streams and Rivers across the state. The data collected during this survey were used to score the overall health of the fish community, based on conditions expected for Wadeable Streams and Rivers in the Tennessee Valley Ichthyoregion. The condition of the fish community was rated as *excellent*, identifying LBTL-1 as having one of the highest functioning ecosystems found in AL. Taxa richness and diversity are extraordinary, with 31 total native species in an 8mi² drainage. Six of the taxa are known to be intolerant and only found in the most pristine streams throughout Alabama. (Table 4)

Table 4. Results of the fish assessment conducted on Little Butler Creek at LBTL-1 on May 3, 2016.

Fish Community Assessment		
	Results	Scores
Taxonomic richness & diversity metrics		
Total Native Species	31	5
Number of shiner species	6	5
Number of Sucker Species	2	5
Number of darter+madtom species	10	5
Tolerance metrics		
Number of intolerant species	6	5
Percent of tolerant species	13	5
Percent Lepomis	3	5
Trophic metrics		
Percent invertivores	5	5
Percent omnivores	24	3
Percent top carnivores	3	5
Abundance, Condition & Reproductive Measures		
Percent DELT+hybrids	0	5
Number of lithophilic spawners	23	5
WMB-I Survey Score		58
WMB-I Survey Rating	Excellent (50-60)	

WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. In situ measurements and water samples were collected monthly and semi-monthly (metals), from March through October 2016 to help characterize the reach. In situ parameters were well within ranges to protect its *F&W* use classification. The *E. coli* sample collected in July slightly exceeded the criteria applicable to the *F&W* use classification; however, this is likely due to heavy rain. Median specific conductance and hardness were higher than expected based on data collected at other reference reaches within the ecoregion. Dissolved oxygen concentrations were good, demonstrating the overall high percent of riffle habitat quality. Median sediment, nutrient, and metals concentrations were among the lowest measured throughout the Highland Rim ecoregion.

SUMMARY

Located within Lauderdale County, the watershed of Little Butler Creek at LBTL-1, which has no permitted outfalls and is 66% forested, is among the best within the Interior Plateau ecoregion. As part of a SHU watershed, the watershed maintains a geomorphically stable channel and a natural flow regime that support the behavior, growth, and survival of three federally listed endangered and threatened species, and nine species listed to be of the *Highest or High Conservation Concern* by the state of Alabama.

Results of the 2016 surveys conducted at LBTL-1 indicate habitat and biological conditions within the reach to be *optimal/sub-optimal* and *excellent*, respectively. Fish diversity and taxa richness within the reach are among the highest sampled in the state. Water quality sampling, fish, and macroinvertebrate community sampling should continue to monitor the ecological health of the stream.

Table 5. Summary of water quality data collected March-October, 2016. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value. Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

Parameter	N	Min	Max	Med	Avg	SD	E
Physical							
Temperature (°C)	9	11.9	23.8	16.9	18.1	4.5	
Turbidity (NTU)	10	1.2	3.4	2.1	2.2	0.8	
Total Dissolved Solids (mg/L)	8	49.0	79.0	69.0	66.9	10.5	
Total Suspended Solids (mg/L)	8 <	1.0	6.0	2.0	2.0	1.8	
Specific Conductance (µmhos/cm)	9	74.0	120.0	102.0 ^G	99.7	15.0	
Hardness (mg/L)	4	38.8	59.7	50.9 ^G	50.1	9.8	
Alkalinity (mg/L)	8	27.5	56.0	44.6	43.0	11.6	
Monthly Stream Flow (cfs)	10	0.8	23.0	5.8	7.2	6.1	
Measured Stream Flow (cfs)	10	0.8	23.0	5.8	7.2	6.1	
Chemical							
Dissolved Oxygen (mg/L)	9	7.6	11.0	8.7	9.0	1.1	
pH (SU)	9	7.2	8.1	7.7	7.7	0.3	
^J Ammonia Nitrogen (mg/L)	8 <	0.018	0.022	0.009	0.011	0.005	
^J Nitrate+Nitrite Nitrogen (mg/L)	8 <	0.014	0.155	0.110	0.095	0.054	
^J Total Kjeldahl Nitrogen (mg/L)	8	0.094	0.647	0.218	0.297	0.190	
^J Dis Reactive Phosphorus (mg/L)	8 <	0.004	0.008	0.004	0.005	0.002	
^J Total Phosphorus (mg/L)	8	0.004	0.009	0.009	0.008	0.002	
CBOD-5 (mg/L)	8 <	2.0 <	2.0	1.0	1.0	0.0	
^J COD (mg/L)	7 <	2.7	6.0	5.0	4.5	1.7	
^J TOC (mg/L)	8	0.7	1.5	1.0	1.0	0.3	
^J Chlorides (mg/L)	8	0.8	1.8	1.1	1.2	0.3	
^J Sulfate (mg/L)	8	2.04	19.20	8.62	8.62	5.42	
Total Metals							
^J Aluminum (mg/L)	4 <	0.012	0.184	0.007	0.051	0.089	
^J Iron (mg/L)	4	0.064	0.096	0.072	0.076	0.014	
^J Manganese (mg/L)	4	0.016	0.038	0.025	0.026	0.011	
Dissolved Metals							
^J Aluminum (mg/L)	4 <	0.012 <	0.014	0.007	0.007	0.000	
^J Antimony (µg/L)	4 <	2.920 <	2.920	1.460	1.460	0.000	
Arsenic (µg/L)	4 <	0.699 <	0.699	0.350	0.350	0.000	
Cadmium (µg/L)	4 <	0.839 <	0.839	0.420	0.420	0.000	
Chromium (µg/L)	4 <	1.050 <	1.050	0.525	0.525	0.000	
Copper (µg/L)	4 <	3.620 <	3.620	1.810	1.810	0.000	
^J Iron (mg/L)	4	0.025	0.059	0.027	0.034	0.016	
Lead (µg/L)	4 <	3.440 <	3.440	1.720	1.720	0.000	
^J Manganese (mg/L)	4	0.012	0.032	0.020	0.021	0.010	
Nickel (µg/L)	4 <	3.260 <	3.260	1.630	1.630	0.000	
Selenium (µg/L)	4 <	1.440 <	1.440	0.720	0.720	0.000	
Silver (µg/L)	4 <	0.905 <	0.905	0.452	0.452	0.000	
Thallium (µg/L)	4 <	1.080 <	1.080	0.540	0.540	0.000	
^J Zinc (µg/L)	4 <	10.600 <	10.600	5.300	5.300	0.000	
Biological							
Chlorophyll a (mg/m ³)	8 <	1.00 <	1.00	0.50	0.50	0.00	
<i>E. coli</i> (MPN/DL)	8	31.5	344.8 ^H	138.5	149.2	94.1	1

E= # of samples that exceeded criteria; G=value higher than median of all verified ecoregional reference reach data collected in ecoregion 71F; H= *F&W* human health criterion exceeded; J=estimate; N=# samples.

FOR MORE INFORMATION, CONTACT:
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